CHAPTER 1: INTRODUCTION

1.1 PURPOSE OF DOCUMENT

This Technical Support Document (TSD) is a "stand-alone" report that provides the technical analyses and results in support of the information presented in the Notice of Proposed Rulemaking (NOPR) for central air conditioners and heat pumps (65 FR 59590, October 5, 2000). This TSD also complements the revised engineering, revised life-cycle cost (LCC), revised national energy savings (NES)/ net present value (NPV), and manufacturer impact results that were originally posted on the Department of Energy's web site on June 30, 2000.

1.2 OVERVIEW OF APPLIANCE STANDARDS

Part B of Title III of the Energy Policy and Conservation Act, Public Law 94-163, as amended by the National Energy Conservation Policy Act, Public Law 95-619, the National Appliance Energy Conservation Act of 1987 (NAECA), Public Law 100-12, the National Appliance Energy Conservation Amendments of 1988, Public Law 100-357, and the Energy Policy Act of 1992, Public Law 102-486, (the Act or EPCA), created the Energy Conservation Program for Various Consumer Products other than Automobiles. 42 U.S.C. 6291-6309. As part of the energy conservation program for consumer products, the Act provides energy conservation standards for 12 types of "consumer products"[a] covered by the Act, and authorizes the Secretary of Energy to prescribe amended or new energy standards for each type (or class) of covered product. EPCA, section 325, 42 U.S.C. 6295.

Before the Department determines whether to adopt a proposed energy conservation standard it must first solicit comments on the proposed standard. EPCA, Section 325 (p), 42 U.S.C. 6295 (p). Any new or amended standard must be designed so as to achieve the maximum improvement in energy efficiency that is technologically feasible and economically justified. EPCA, Section 325(o)(2)(A), 42 U.S.C. 6295 (o)(2)(A). To determine whether economic justification exists the Department must review comments on the proposal and determine that the benefits of the proposed standard exceed its burdens by weighing, to the greatest extent practicable, the following seven factors:

(1) The economic impact of the standard on the manufacturers and on the consumers of the products subject to such standard;

[a] The 12 products are: (1) refrigerators, refrigerator-freezers, and freezers; (2) room air conditioners; (3) central air conditioners and central air-conditioning heat pumps; (4) water heaters; (5) furnaces; (6) dishwashers; (7) clothes washers; (8) clothes dryers; (9) direct heating equipment; (10) kitchen ranges and ovens; (11) pool heaters; and (12) flourescent lamp ballasts.

(2) The savings in operating costs throughout the estimated average life of the covered product in the type (or class) compared to any increase in the price, initial charges, or maintenance expenses for the covered products that are likely to result directly from the imposition of the standard;

(3) The total projected amount of energy savings likely to result directly from the imposition of the standard;

(4) Any lessening of the utility or the performance of the covered products likely to result from the imposition of the standard;

(5) The impact of any lessening of competition, as determined in writing by the Attorney General, that is likely to result from the imposition of the standard;

(6) The need for national energy and water conservation; and

(7) Other factors the Secretary considers relevant.

1.3 OVERVIEW OF CENTRAL AIR CONDITIONER AND HEAT PUMP STANDARDS

NEACA required the Department to publish final rules by January 1, 1994, to determine if the standards for central air conditioners and central air conditioning heat pumps should be amended. The Act provided that any amendment to the standards for the seasonal energy efficiency ratio (SEER) would apply to products manufactured on or after January 1, 1999. Any amendment to the standards for the heating seasonal performance factor (HSPF) would apply to products manufactured on or after January 1, 2002. The Act also requires the Department to publish a subsequent final rule no later than January 1, 2001.

In 1992**,** the Department initiated engineering and LCC studies for central air conditioners and heat pumps based on use of computer simulation models. An ad hoc working group was formed to advise the Department and to provide engineering and test data to use with the computer models. The working group, which included representatives from central air conditioner and heat pump manufacturers, the Air Conditioning & Refrigeration Institute (ARI), Lawrence Berkeley National Laboratory (LBNL), and Oak Ridge National Laboratory (ORNL), also provided production cost data for establishing the cost-effectiveness of the various design options selected for study.

On September 8, 1993, the Department published an Advance Notice of Proposed Rulemaking (ANOPR) (58 FR 172, September 8, 1993) which discussed the number of product classes and design options, the computer simulation models, and the methodologies which the Department intended to use in its analysis of increased energy efficiency standards for central air conditioners and heat pumps. After the ANOPR was issued, the Department continued its analysis

of LCCs, payback periods, and preliminary NES which were shared with representatives from the air-conditioning industry.

In 1995, the Department abandoned the approach of using computer simulation models as a result of concerns expressed by the industry. The concerns included: the cost/performance relations derived from the computer simulations were not consistent with the experience of the industry; the assumptions and procedures were flawed; and the industry expressed doubts over the Department's experience with selection of appropriate design options.

In October, 1995, a moratorium on proposing, issuing, or prescribing energy conservation standards took effect pertaining to standards for central air conditioners and heat pumps, and the dialogue between the air-conditioning industry and the Department, on the analysis performed, was suspended.

During consideration of the fiscal year 1996 appropriations, there was considerable debate about the efficacy of the standards program. The Department of the Interior and Related Agencies Appropriations Act for Fiscal Year 1996 included the aforementioned moratorium on proposing or issuing energy conservation appliance standards for the remainder of Fiscal Year 1996. *See* Pub. L. 104-134. Congress advised DOE to correct the standards-setting process and to bring together stakeholders (such as manufacturers and environmentalists) for assistance. In September 1995, the Department announced a formal effort to consider further improvements to the process used to develop appliance efficiency standards, calling on manufacturers, energy efficiency groups, trade association, state agencies, utilities and other interested parties to provide input to guide the Department. On July 15, 1996, the Department published a Final Rule: Procedures for Consideration of New or Revised Energy Conservation Standards for Consumer Products (hereinafter referred to as the Process Rule). (61 FR 36974, July 15, 1996).

The Process Rule outlines the procedural improvements identified by the interested parties. The process improvement effort included a review of the: 1) economic models, such as the Manufacturer Analysis Model and Residential Energy Model; 2) analytical tools, such as the use of a Monte Carlo sampling methodology; and 3) prioritization of future rules. The Process Rule requires the evaluation of uncertainty and variability by doing scenario or probability analysis (as detailed in the Process Rule, 10 CFR part 430, Subpart C, Appendix A §§ 1(f), 4(d)(2), and 10(f)(1)). In addition, an Advisory Committee on Appliance Energy Efficiency Standards, consisting of a representative group of these interested parties, was established to make recommendations to the Secretary regarding the implementation of the Process Rule.

The Process Rule is applicable to the rulemaking to develop new central air conditioner and heat pump standards. The rulemaking process is dynamic. If timely new data, models or tools that enhance the development of standards become available, they will be incorporated into the rulemaking. For example the Advisory Committee has made several recommendations and the Department has developed new models for the determination of life-cycle costs (LCC) (Chapter 5), shipments (Chapter 6), and national energy savings (NES) and net present value (NPV) (Chapter 7).

In addition there are plans to use new models in this rulemaking for the manufacturer impact analysis (Chapter 8), net national employment analysis (Chapter 7), utility impact analysis (Chapter 11), and environmental assessment. As just noted, all these models are discussed and presented in this TSD.

The Department held a workshop on June 30, 1998 to discuss the analytical framework that was being proposed for conducting the central air conditioner and heat pump rulemaking. The analytical framework presented at the workshop described the different analyses (e.g., the LCC, payback and national impact analyses) to be conducted (Table 1.1), the methods proposed for conducting them, and the relationship among the various analyses.

Table 1.1 Central Air Conditioner and Heat Pump Analyses under Process Rule

ANOPR	NOPR	Final Rule
Screening Analysis	Revised Pre-ANOPR Analyses (LCC and National Impacts Analyses)	Revise Analyses (LCC and National Impacts Analyses)
Engineering Analysis	Consumer Sub-group Analysis	
LCC Analysis	Industry Cash Flow Analysis (GRIM)	
Preliminary National Impacts Analysis	Manufacturer Impact Analysis	
	Utility Impact Analysis	
	Environmental Analysis	

On November 24, 1999, DOE published a Supplemental ANOPR. 64 FR 66306. In the Supplemental ANOPR and during the December 9, 1999, public workshop, interested persons were provided with an opportunity to comment on several issues, including:

(1) the product classes that the Department planned to analyze;

(2) the analytical framework, models (e.g., the Government Regulatory Impact Model (GRIM)), and tools (e.g., a Monte Carlo sampling methodology, and the life-cycle cost (LCC) and national energy savings (NES) spreadsheets) that the Department was using in performing analyses of the impacts of energy conservation standards;

(3) the results of preliminary analyses for the engineering, LCC, payback and NES; and

(1) the candidate energy conservation standard levels that the Department had developed from these analyses.

The Department has reviewed the recommendations made by the Advisory Committee on Appliance Energy Efficiency Standards on April 21, 1998. (Advisory Committee, No. 96) These recommendations relate to using the full range of consumer marginal energy rates (CMER) in the LCC Analysis (replacing the use of national average energy prices), defining a range of energy price futures for each fuel used in the economic analyses and defining a range of primary energy conversion factors and associated emission reductions, based on the electricity generation displaced by energy efficiency standards for each rulemaking. The Department has incorporated the use of consumer marginal energy rates and a range of future energy prices for the analysis that was conducted for the NOPR.

1.4 STRUCTURE OF THE DOCUMENT

This TSD consists of twelve Chapters, eight Appendices, and Environmental Assessment, and Regulatory Impact Analysis.

Chapter 1 Introduction: provides an overview of the appliance standards program and how it applies to the central air conditioner and heat pump rulemaking, and outlines the structure of the document.

Chapter 2 Analytical Framework: describes the new rulemaking process step-by-step.

Chapter 3 Screening Analysis: characterizes the relevant product markets and existing technology options including prototype designs.

Chapter 4 Engineering Analysis: contains detailed efficiency and cost information including methods for determining manufacturer costs. Also discussed are the methods for establishing mark-ups for converting manufacturer costs to consumer equipment prices.

Chapter 5 Life-Cycle Cost and Payback Period Analysis: describes the effects of standards on individual purchasers and users of the appliances. It compares the life-cycle cost of appliances and other measures of consumer impact with and without the proposed standards.

Chapter 6 Shipments Analysis: describes the methodology for forecasting shipments using a sophisticated accounting model. Decisions that are economically influenced are modeled with econometric equations.

Chapter 7 National Energy Savings and Net Present Value Analysis: describes national forecast of energy consumption and net present value in the absence (or presence) of new regulations.

Chapter 8 Manufacturer Impact Analysis: describes the financial impact on manufactures.

Chapter 9 Competitive Impact Analysis: describes the effect of standards on the competition between manufacturers.

Chapter 10 Consumer Sub-GroupAnalysis: describes the effect of standards on low-income sub-group of households.

Chapter 11 Utility Impacts Analysis: determines the decrease in electricity needed and the primary energy source for electricity generation.

Chapter 12 Net National Employment Impact Analysis: determines the impact of standards on national employment.

Appendix A Approach for Uncertainty and Variability

Appendix B Detailed Reverse Engineering Cost Estimates and Equipment Data

Appendix C Technical Description of the Reverse Engineering Cost Estimation Methodology

Appendix D Estimation of the Distributor/Wholesaler and Dealer/Contractor Markups on Incremental Central Air Conditioner and Heat Pump Costs

Appendix E Life-Cycle Cost Results and Determination of 30-year Average Cooling Degree Day and Heating Degree Day Data

Appendix F National Energy Savings and National Net Present Value Results

Appendix G Government Regulatory Impact Model (GRIM)

Appendix H Interpolation of Utility and Environmental Results from NEMS-BRS Output

Environmental Assessment: determines the reduction in emissions due to higher efficiency standards.

Regulatory Impact Analysis: analysis impact of non-regulatory alternatives to standards.